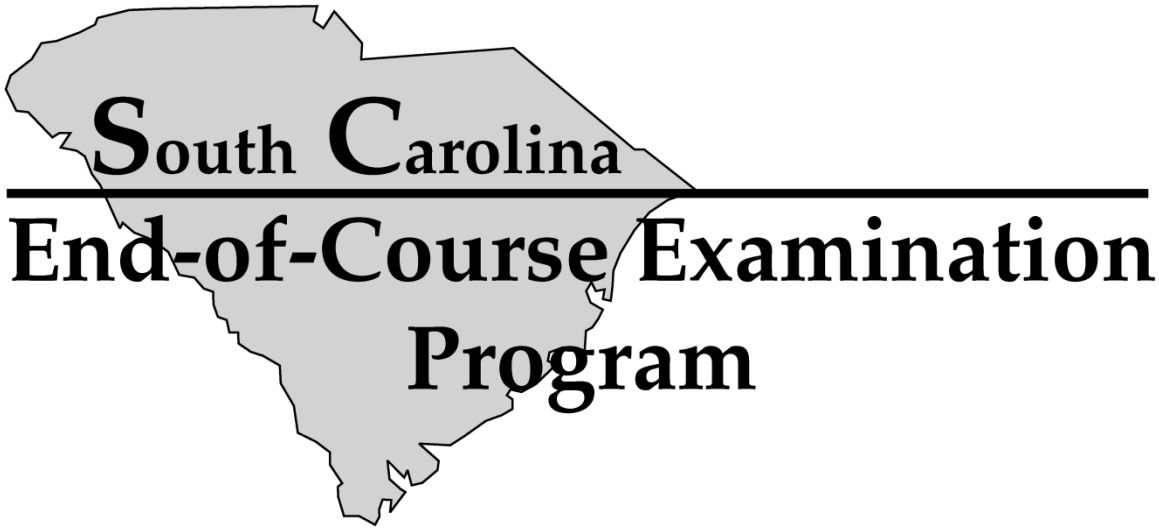


Teacher's Guide and Sample Items

Biology 1 Examination

Issued by the

Office of Assessment
South Carolina Department of Education

2016

Introduction

This Teacher's Guide with Sample Items has been developed to provide educators with sample questions to help prepare students for the examination and to provide important links to information about the End Of Course Examination Program (EOCEP).

Sample Items

This section contains sample test items that are representative of the questions used on the Biology EOCEP. These questions are only a sample of what students should expect to encounter on the actual examination. The items illustrate the format, type, and approximate level of difficulty of the examination questions. For most sample question, the relevant strand, sub-strand, and standard are identified. The text describes what content the item is testing, what the student must know to be able to answer the item correctly, and what errors students most commonly make. In addition, information is included regarding other concepts that may be measured by the standard.

The test questions on the Biology EOCEP examination are aligned with the 2014 South Carolina Standards for Biology and the 2005 B-5 Standard and are designed to assess students' mastery of these standards. The examination will consist of multiple choice items and Scenario Sets with three items related to the scenario.

Online Training Tools (OTT)

In addition to multiple-choice items, the online version of the EOCEP for Biology1 contains technology-enhanced items. Teachers are encouraged to provide students with multiple opportunities to access the online tools training (OTT) located on the Insight portal for the South Carolina Online Assessments. The OTT will allow students to practice navigating representative online item types prior to testing. The OTT is accessible at the following link: https://wbte.drcedirect.com/SC/portals/sc (use Chrome browser)

Links

Please visit the following links for the most up-to-date information on the following topics:

- End-of-Course Examination Program (EOCEP): http://ed.sc.gov/tests/high/eocep/
    - Here you can find more content specific information if you scroll down the page.
- EOCEP Accommodations: http://ed.sc.gov/tests/assessment-information/testing-swd/accommodations-and-customized-forms/
    - Here you can find information on accommodations.
- Office of Standards and Learning: http://ed.sc.gov/instruction/standards-learning/
    - Here you can find standards, support documents, and suggested resources.
- Online Tools Training: https://wbte.drcedirect.com/SC/portals/sc (use Chrome browser)
    - Here students may practice technology enhanced items.

Sample Question 1

Standard: H.B.2 The student will demonstrate the understanding that the essential functions of life take place within cells or systems of cells.

Indicator: H.B.2A.1 Construct explanations of how the structures of carbohydrates, lipids, proteins, and nucleic acids (including DNA and RNA) are related to their functions in organisms.

Which statement correctly compares a function of fats to a function of proteins in the body?

A. Fats cushion the organs, and proteins insulate the body.

B. Fats insulate the body, and proteins control contraction.

C. Fats store energy, and proteins provide the primary fuel for respiration.

D. Fats coordinate body activities, and proteins provide monosaccharides.

Key: B

This item requires the student to understand that the three main nutrient groups (proteins, carbohydrates and fats) serve different functions in the body. Fats provide long-term energy storage, cushion body organs and insulate the body. There are many types of proteins which serve different functions, such as hormonal proteins which regulate body activities, contractile proteins which control muscle contraction and enzymatic proteins which accelerate the speed of chemical reactions. The correct answer is Option B which correctly identifies a function of fats and of proteins.

- Option A is not correct because fats function to both cushion the organs and insulate the body; proteins do not insulate the body.

- Option C is not correct because while fats do store energy, proteins do not provide the primary fuel for respiration. Carbohydrates are the main source of energy for the body. Complex carbohydrates are broken down during digestion to glucose which is used as the primary fuel in the process of cellular respiration to provide energy. Proteins would only be used as a fuel source under extreme conditions such as starvation or malnutrition. It is a common misconception that "protein bars" provide the body with energy. The proteins in a "protein bar" can function in muscle contraction in enzymatic reactions but carbohydrates are the body's primary source of energy.

- Option D is not correct because fats do not coordinate body activities (this is a function of hormonal proteins) and proteins are not a source of monosaccharides, which are the building blocks of carbohydrates.

Sample Question 2

Standard: H.B.3A The student will demonstrate the understanding that all essential processes within organisms require energy which in most ecosystems is ultimately derived from the Sun and transferred into chemical energy by the photosynthetic organisms of that ecosystem.

Indicator: H.B.3A.2 Develop and revise models to describe how photosynthesis transforms light energy into stored chemical energy.

Which step in the process of photosynthesis is dependent on light energy?

A. splitting water into hydrogen and oxygen

B. combining hydrogen and oxygen to form water

C. splitting carbon dioxide into carbon and oxygen

D. combining carbon and oxygen into carbon dioxide

Key: A

This item requires the student to understand the reactions involved in the process of photosynthesis. In previous grades students learned the basic process of photosynthesis as the creation of glucose (sugar) from carbon dioxide and water using the sun's energy. In biology it is necessary to delve further into the process to understand that two steps are involved. The first step, light-dependent reaction, requires light energy to split water molecules which creates energy and releases oxygen as a by-product. Therefore the correct answer is A.

- Option B is not correct since it is the opposite of the reaction which occurs in the light- dependent step.
- Option C is not correct since carbon dioxide is not split in the process of photosynthesis. In the dark reactions (not requiring light energy) carbon dioxide is used to produce glucose.
- Option D is not correct since the combining of carbon and oxygen to create carbon dioxide does not take place in photosynthesis.

Sample Question 3

Standard: H.B.3 The student will demonstrate the understanding that all essential processes within organisms require energy which in most ecosystems is ultimately derived from the Sun and transferred into chemical energy by the photosynthetic organisms of that ecosystem.

Indicator: H.B.3A.4 Develop models of the major inputs and outputs of cellular respiration (aerobic and anaerobic) to exemplify the chemical process in which the bonds of molecules are broken, the bonds of new compounds are formed and a net transfer of energy results.

Which statement is true about cellular respiration?

A. It produces glucose, which provides energy for the cell.

B. It produces ATP, which stores energy that is used by the cell.

C. It produces carbon dioxide, which combines with hydrogen to form sugar.

D. It produces oxygen, which combines with hydrogen to prevent cell poisoning.

Key: B

This item requires students to understand the process of cellular respiration in which chemical energy stored in food is converted to chemical energy stored in ATP. Glucose is broken down in multiple steps, starting with the process of glycolysis, and ATP (adenosine triphosphate) is produced, providing storage of the energy that can be used by the cell. Option B, therefore,
is correct.

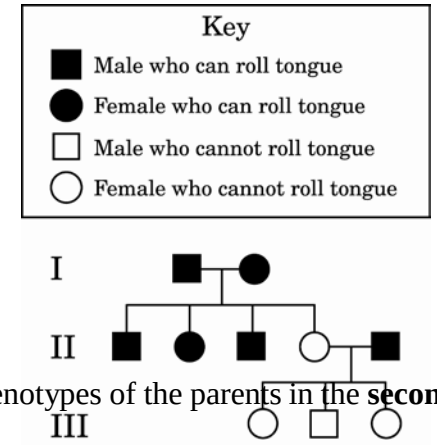
- Option A is incorrect because glucose is not produced during cellular respiration; it is broken down.
- Option C is incorrect because carbon dioxide, which is produced during cellular respiration, does not combine with hydrogen to form sugar (as in the process of photosynthesis); it is carried in the blood to the lungs, where it is exhaled.
- Option D is incorrect because oxygen is not produced during cellular respiration; rather, during aerobic respiration it combines with hydrogen to form water.

Sample Question 4

Standard: H.B.4 The student will demonstrate an understanding of the specific mechanisms by which characteristics or traits are transferred from one generation to the next via genes.

Indicator: 4.B.4C.2 Analyze data on the variation of traits among individual organisms within a population to explain patterns in the data in the context of transmission of genetic information.

The pedigree below shows the occurrence of tongue rolling in three generations of a family (*T* = the ability to roll the tongue; *t* is the inability to roll the tongue):



What are the most likely genotypes of the parents in the **second (II)** generation?

A. mother tt, father Tt

B. mother tt, father TT

C. mother Tt, father tt

D. mother TT, father tt

Key: A

This item requires students to understand how to read a pedigree. Students must know the difference between dominant and recessive traits and should recognize that the trait of tongue rolling is dominant. If it were recessive, then carriers would be present. Students should also recognize that the trait is most likely autosomal since both males and females are able to roll their tongues. Since the mother in the second generation is unable to roll her tongue, her genotype must be tt. The genotype of the father in the second generation could be TT or Tt since he is able to roll his tongue. If it were TT, however, all the offspring would have the trait; none does. Thus the genotype of the father must be Tt. Option A (mother tt, father Tt) is the correct answer.

- Option B is incorrect: if the genotype of the male parent were TT, all offspring would have the tongue-rolling trait.

- Option C is incorrect since the mother does not have the tongue-rolling trait, which is dominant, and must have the genotype tt.

- Option D is incorrect since the mother is unable to roll her tongue and her genotype must be tt.

Sample Question 5

Standard: B.5 The student will demonstrate an understanding of biological evolution and the diversity of life.

Indicator: B.5.4

Explain how genetic variability and environmental factors lead to biological evolution.

Genetic equilibrium exists in a population that is stable. Which conditions would support genetic equilibrium within a species?

A. frequent mutations

B. random mating

C. small number of individuals

D. migration into the population

Key: B

This item requires students to understand the principle of genetic equilibrium (the Hardy-Weinberg principle) which describes the conditions that contribute to a genetically stabilized population in which there is no significant change in the genetic frequencies within a species. One of the conditions contributing to genetic equilibrium is random mating which would ensure that allelic frequencies remain constant in the population and, therefore, Option B is the correct answer.

- Option A is not correct because frequent mutations would results in changes in genotype within the population.

- Option C is not correct because within small populations a particular allele may increase in frequency just by chance resulting in a decrease in genetic stability.

- Option D is not correct because migration into the

population results in the introduction of new alleles which would promote new genotypes and not support genetic equilibrium.

Sample Item 6

Standard: B-5 The student will demonstrate an understanding of biological evolution and the diversity of life.

Indicator: B-5.5 Exemplify scientific evidence in the fields of anatomy, embryology, biochemistry, and paleontology that underlies the theory of biological evolution.

Species evolve over time. Their success depends on factors such as genetic variability and environmental constraints. Modern land plants and green algae have many characteristics in common, and both are very successful.

One current theory suggests that modern land plants evolved from green algae. Which piece of evidence supports this theory?

A. Land plants and green algae carry out cellular respiration.
B. Land plants and green algae carry out asexual and sexual reproduction.
C. Land plants and green algae are made up of cells containing similar cell structures.
D. Land plants and green algae contain chlorophyll made up of similar sequences of amino acids.

Key: D

This item requires students to recognize evolutionary relationships from comparative biochemistry. Students must be able to evaluate pieces of evidence to determine which piece supports the theory that modern land plants could have evolved from green algae. There are a number of different photosynthetic pigments, and the fact that a chlorophyll found in modern green plants and green algae is made up of similar sequences of amino acids suggests that one could have evolved from the other. Thus, option D is the correct answer.

The evidence contained in options A, B, and C is common to many organisms.

- Option A is incorrect since the cells of almost all living organisms carry out cellular respiration.
- Option B is incorrect since many organisms reproduce sexually and asexually and this has no relevancy to evolution.
- Option C is incorrect since most eukaryotes contain similar cell structures.

Scenario Sample

Use the information to answer sample questions 7-9.

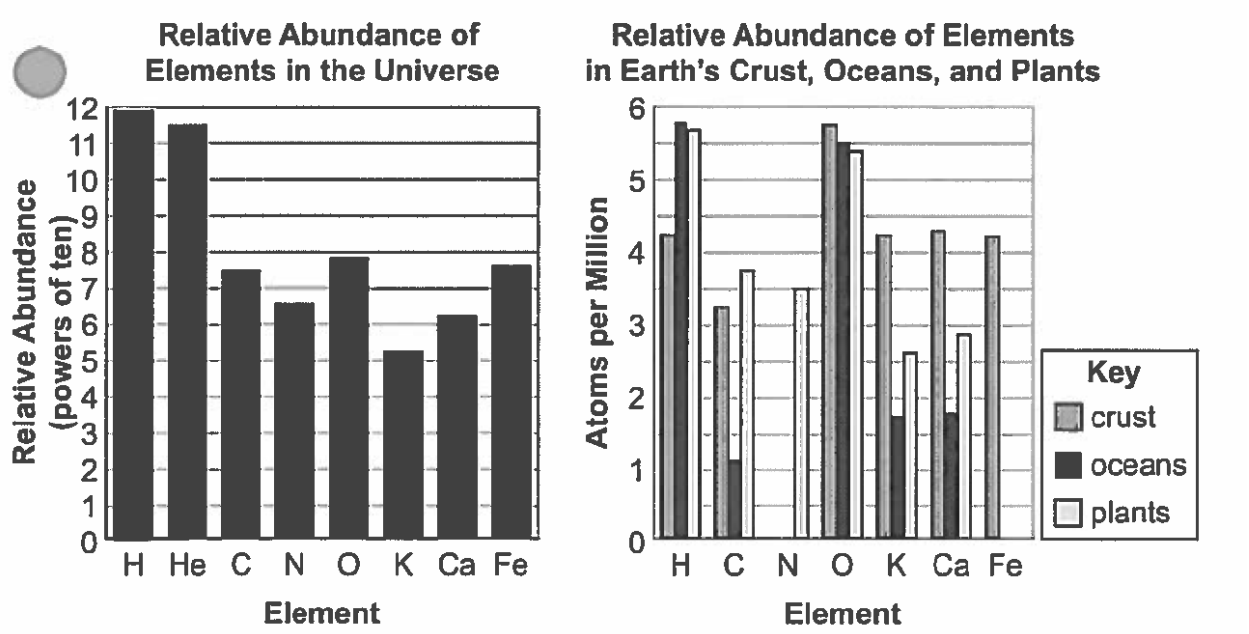
Is There Life Out There?

Scientists are attempting to find life forms throughout the universe by investigating planets, asteroids, moons, and meteors. These locations likely lack available oxygen and are extremely cold or extremely hot. Most are places where humans could not survive. How does a scientist begin the search for life?

Earth's fossil record can help scientists in their search for life in space. The first cells on Earth lived in very harsh conditions. These single-celled organisms, called archaea, thrived in conditions such as extreme radiation, volcanic activity, heavy rainfall, extensive lightning, and an atmosphere that lacked available oxygen. These organisms still exist across the planet. They live in areas as diverse as the ice of Antarctica and the geothermal hot springs of Yellowstone National Park. Scientists theorize that if these organisms can survive on Earth in such extreme environments, they can exist in other locations, too.

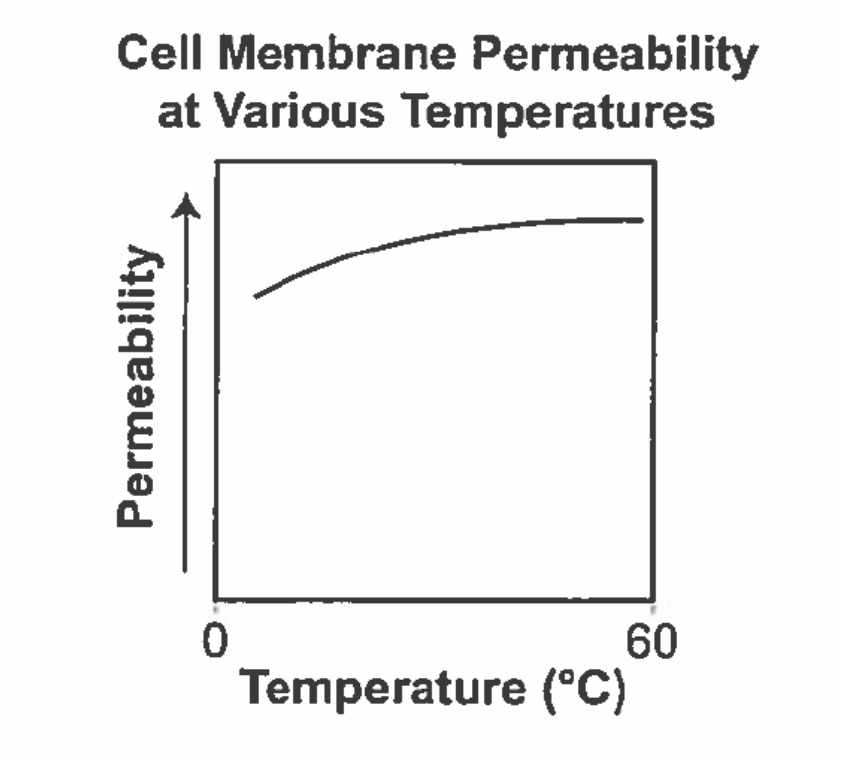
The question remains, how do scientists discover microscopic life in space? Rather than search for the actual organisms, scientists search space for areas that have concentrated stores of the elements essential for life as we understand it. The presence of these elements does not ensure that life exists there, but if the basics are there, the discovery of primitive cells is a possibility. The graphs represent the relative abundance of some elements in the universe and in various locations on Earth.

Is there life in the universe in addition to life on Earth? At the very least, the elements needed for the molecules of life are out there.



Sample Item 7

A student wanted to understand how organisms reacted to the high atmospheric temperatures of early Earth. The student designed an experiment to determine how temperature affects the carbon dioxide permeability of a cell membrane.



Which statement best summarizes the resulting data?

A. Carbon dioxide movement across the membrane decreased as the permeability of the membrane increased.

B. The permeability of the membrane decreased when heated, allowing more carbon dioxide to pass through the membrane.

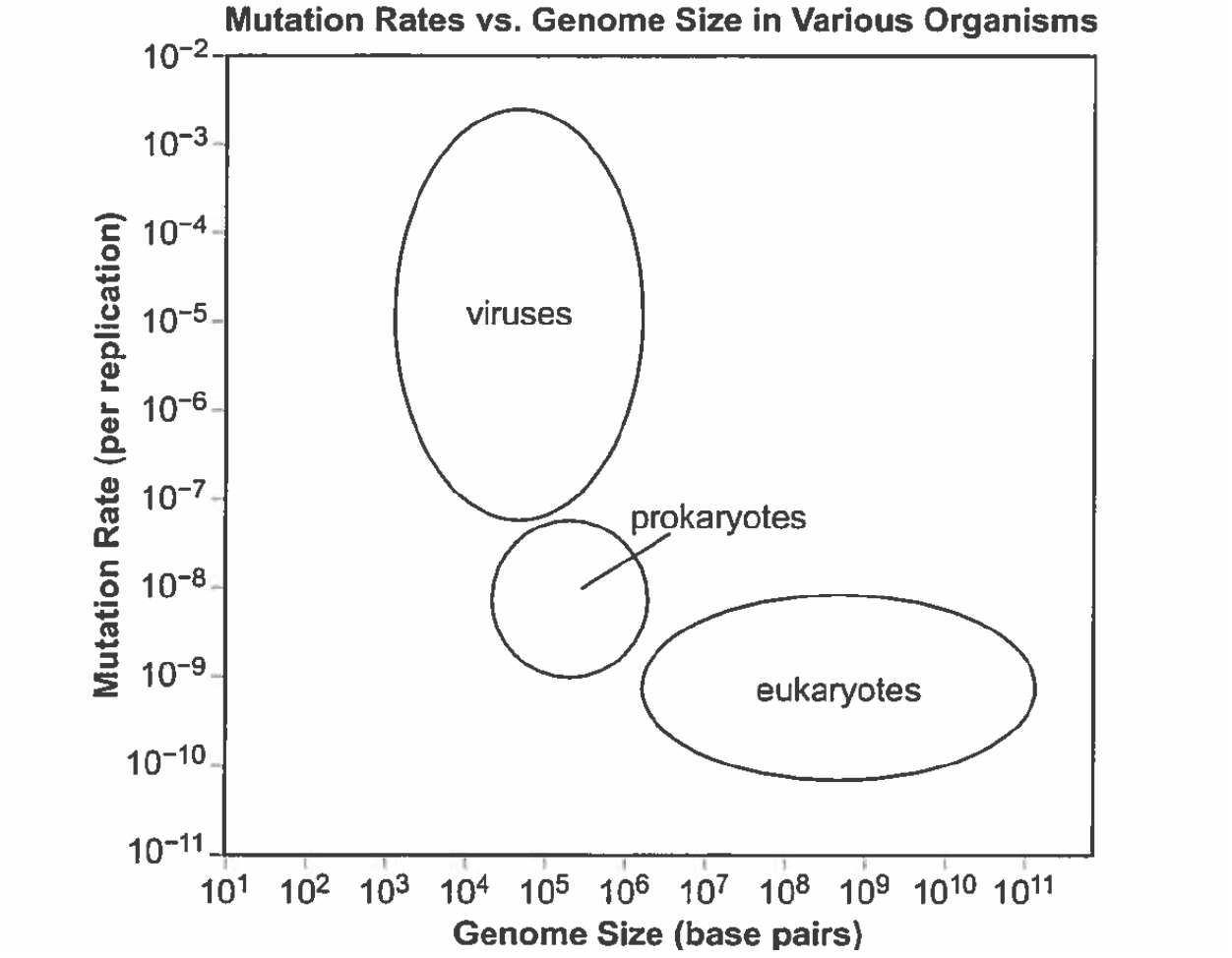
C. The rate of photosynthesis increased because more carbon dioxide passed through the membrane at higher temperatures.

D. As temperature increased, the movement of carbon dioxide across the membrane increased slightly until it reached a maximum.

Key: D

Sample Item 8

Some scientists have proposed that viruses may exist in space. Viruses need a living cell to produce new viruses. One virus can lead to the production of millions of other viruses by taking over the operation of a single living cell. The graph shows the mutation rates of viruses, prokaryotes, and eukaryotes.



Which statement best summarizes this information?

A. Eukaryotes mutate at a faster rate than other types of organisms because they have a large genome.

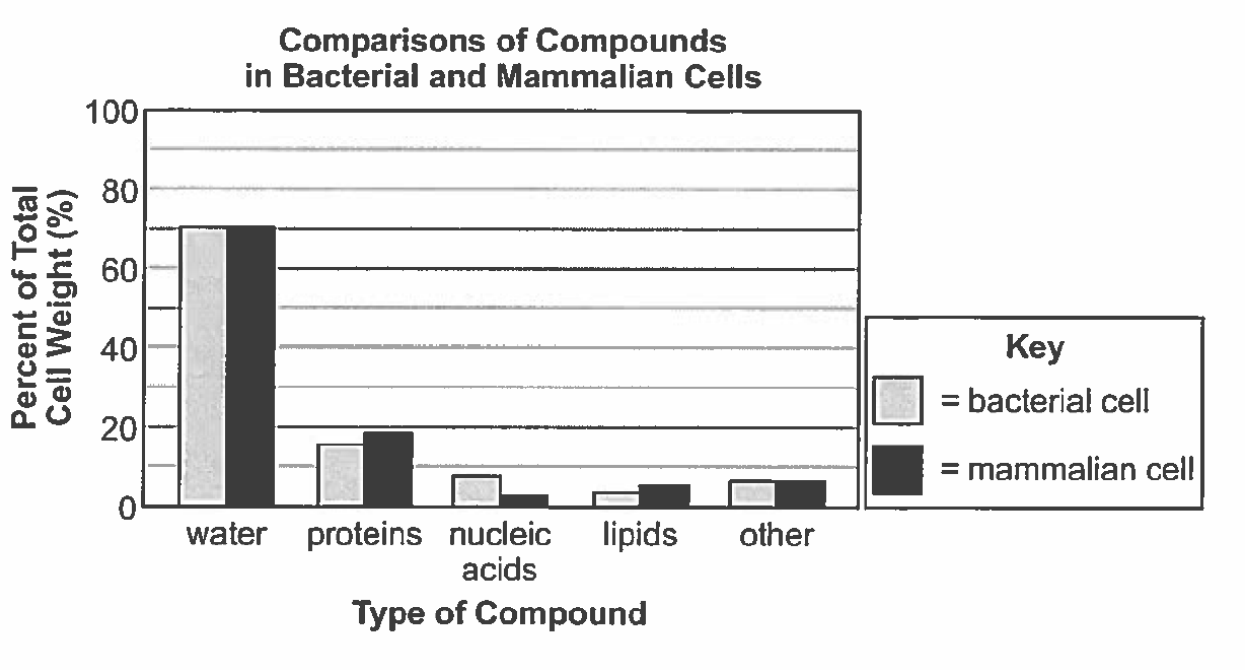
B. Eukaryotes mutate at a slower rate than other types of organisms because mitosis is a time-consuming process.

C. Viruses mutate at a slower rate than other types of organisms because of the large amount of DNA in their cells.

D. Viruses mutate at a faster rate than other types of organisms because of their small genome and their high reproductive rate.

Key: D

Sample Item 9



A student used the graph below and information from the passage to answer a question about life on Earth.

Which question was the student most likely attempting to answer?

A. Why is carbon the backbone of many molecules in bacterial and mammalian cells?

B. How do elements found throughout the universe become a part of bacterial and mammalian cells?

C. Which element is essential to both bacteria and mammals but is relatively limited in the universe?

D. Which compound is found in the atmosphere of all planets and within the membrane of bacterial cells?

Key: C